

Philip M. Sadler, Ed.D.  
 Harvard-Smithsonian Center for Astrophysics  
 60 Garden Street, MS-71  
 Cambridge, MA 02138

Tel: 617-496-4709  
 Fax: 617-496-5405  
 Email: psadler@cfa.harvard.edu

## EDUCATION

Massachusetts Institute of Technology, Cambridge, MA B.S. Physics, 1973  
 Harvard Graduate School of Education, Cambridge, MA Ed. M. 1974, Ed. D. 1992  
 Dissertation: *The Initial Knowledge State of High School Astronomy Students*

## PROFESSIONAL EMPLOYMENT

Harvard University Astronomy Department, Cambridge, MA	F.W. Wright Senior Lecturer	2001-present
	Lecturer	1990-2000
Harvard University Graduate School of Education	Faculty Affiliate, Ph.D. Program	2015-present
	Assistant Professor, half-time	1992-2001
	Instructor	1991-1992
Director, Science Education Department, Harvard-Smithsonian Center for Astrophysics		1992-present
Project Manager, Harvard-Smithsonian Center for Astrophysics		1985-1991
Vice President and Partner, Peripheral and Software Marketing Inc., Newton, MA		1982-1985
<i>Sales and marketing of computer software, sold interest in 1985</i>		
Vice President and Partner, Computer Products Marketing Inc., Newton, MA		1981-1985
<i>Apple Computer's exclusive representative in New England for retail sales and training, sold interest in 1985</i>		
Learning Technologies Inc., Somerville, MA	Chairman	1986-2008
<i>Manufacturing products for teaching astronomy, company sold interest in 2008</i>		
Science and math teacher (grades 7, 8) and Science Coordinator, Carroll School, Lincoln, MA	President	1977- 1985
Staff Developer, Calculus Project, Education Development Center, Newton, MA		1974-1977
Staff Member, Mathematics Project, Educational Research Center, MIT, Cambridge, MA		1973-1974
		1971-1973

## HONORS AND AWARDS

International Planetarium Society's Technology and Innovation Award	2014
Robert A. Millikan Medal, American Association of Physics Teachers	2012
Education Prize, American Astronomical Society	2010
Thomas J. Brennan Award, Astronomical Society of the Pacific	2002
Astronomy Education Recognition Award, Project ASTRO, Astronomical Society of the Pacific	2001
Journal of Research in Science Teaching Annual Award	1999
Computers in Physics, Winner for MicroObservatory, American Institute of Physics (shared)	1998
Computers in Physics, Winner for Mouselab, American Institute of Physics (shared)	1994
Silver Plaque Award for "Sun, Moon, Stars," Industrial Film & Video Festival (shared)	1992
Computers in Physics, Honorable Mention for MBL Spectrometer, American Inst. of Physics (shared)	1992
Computers in Physics, Winner for Wavemaker, American Institute of Physics (shared)	1991
Margaret Noble Address, Middle Atlantic Planetarium Society	1991
Representative, U.S.- Soviet Commission on Education, National Academy of Education	1988
Executive Producer, "A Private Universe," Pyramid Films and Annenberg Media	
Blue Ribbon, American Film and Video Association (shared)	1990
Gold Medal, Documentary, Houston International Film Festival, Houston, TX (shared)	1988
Gold Plaque Award, Chicago International Film Festival (shared)	1989
Silver Apple, National Educational Film and Video Festival, Seattle, WA. (shared)	1987
Representative of the Year (Worldwide), Apple Computer (shared)	1982
U.S. Patents:	
7,177,077 Sunspotter Solar Telescope	2/13/07
7,004,588 Planetarium and Point Lights Source for Use in Same	2/28/06
6,614,593 Sunspotter Solar Telescope	9/2/03
4,178,701 Cylindrical Projector (for portable planetarium)	12/18/79
4,164,829 Inflatable Structure (for portable planetarium)	8/21/79

## TEACHER CERTIFICATION

Massachusetts Certificate #183612, General Science, Physics, Mathematics, grades 7-12

8/12/74

## PROFESSIONAL MEMBERSHIP

American Association of Physics Teachers	American Astronomical Society
National Science Teachers Association	National Association for Research in Science Teaching
The Psychometric Society	National Council on Measurement in Education
American Educational Research Association	Astronomical Society of the Pacific

## ADVISORY BOARDS

Board of Directors, Astronomical Society of the Pacific	2014-2016
Faculty Advisor, Harvard Bisexual, Gay, Lesbian, Transgender, Queer & Allied Students in the Sciences (HBASIS)	2014- present
Advanced Standing Subcommittee of the Educational Policy Committee, Harvard University	2013
Science Department Review Panel, Choate Rosemary Hall School, Wallingford, CT	2011
Astro 2010 Infrastructure Study Group on Education and Public Outreach	2010
Harvard College Education Society, Faculty Advisor	2010-2012
American Astronomical Society Education Board	2008-11
USED High School Longitudinal Study of 2009, Technical Review Board, Washington, DC	2008-10
Science Department Review Panel, St. Paul's Academy, Concord, NH	2008
American Educational Research Association, Grants Program Governing Board	2006-2009
Science in the 21st Century Forum	2006
Council of Advisors, Astronomy Education Review	2002-2009
Science Advisory Committee, Milton Academy, Milton, MA	2002-2003
Group Leader, Smithsonian Institution Education Task Force, Washington, DC	2003
Milton Academy, K-12 Science Evaluation Committee, Milton, MA	2002
Science Learning Study Initiative, National Academy of Science, Washington, DC	2002
Design in the Science Classroom, Georgia Institute of Technology, Atlanta, GA	2000-2004
Evolution Education Research Centre, McGill University, Montreal, Canada	1999-2009
Buckingham, Brown and Nichols, K-12 Science Evaluation Committee, Cambridge, MA	1998
Center for Earth and Space Science Education, TERC, Cambridge, MA	1998-2000
Annenberg Channel One, MCET, Cambridge, MA	1996-2000
US Dept of Ed/NRC, Integrating Academic and Vocational Education, Washington, DC	1995
Astronomy and Space Science Summer Institute, University of California, Berkeley	1992-1993
Space Telescope Science Institute, Advisory Council on Education, Baltimore, MD	1994-1996
Boston Museum of Science, Planetarium Advisory Committee	1992-2004
Cambridge Public Schools, Science Advisory Board, Cambridge, MA	1988-1994

## PEER REVIEW

National Science Foundation	
Division of Astronomical Sciences, Peer Review	2017
Research on Engineering Education, Peer Review Panel	2012
Division of Astronomical Sciences, Peer Review	2010
Instructional Materials Development, Peer Review Panel	2006
Research on Learning and Education, Peer Review Panel	2004
Interagency Educational Research Initiative, Peer Review Panel	2000
Small Business Innovation Fund, Peer Review Panel	1999-2003
Journal of Science Education and Technology, Editorial Board	1999-2006
International Journal of Science Education, Editorial Board	1998-2003
The Physics Teacher, Reviewer	1997-2005

## SOFTWARE, HARDWARE, WEBSITES

Schneps, Griswold, Sadler, FICSS Website, 2006  
Deutsch, Sadler, Whitney, Enquist, and Shore, Wavemaker. Physics Academic Software, 1995  
Deutsch, Sadler, Whitney. Mouselab. Sunburst Software, 1996.  
Antonucci and Sadler, Microcomputer-Based Spectrophotometer, Salem, MA. Daedalon Corporation, 1996

Deutsch, Gould, Sadler, Antonucci and Leiker, MicroObservatoryNet Website, 1998.

#### VIDEOS

1. Schneps, Matthew, and Sadler, Philip. A Private Universe. Annenberg/CPB, 1988.
2. Schneps, Griswold, and Sadler. Project STAR, Teacher-to-Teacher Series, Kendall/Hunt, 1993.
3. Schneps, Griswold, and Sadler. Sun, Moon, Stars/Harvard College, 1993
4. Schneps, Sadler, Whitney, and Shapiro, Minds Of Our Own Series, Annenberg/CPB, 1998.

#### BOOKS

1. Walton, Schey, Christie, Garfunkel & Sadler. (1975) *Computer and Laboratory Calculus*, Educational Development Center, Newton, MA.
2. Sadler, Philip et al. (1982) *Apple III Certification*, Apple Computer, Framingham, MA.
3. Sadler, Philip et al. Project STAR. (1990) *Where We Are in Space and Time*, Yulee, FL: Science First.
4. Coyle, Gregory, Luzader, Sadler, and Shapiro. Project STAR. (1993) *The Universe in Your Hands*, Dubuque, IA: Kendall/Hunt Publishing.
5. Colby, Sadler, Kratzer, and Klonz. (1998) *Astronomy and More: A Comprehensive Curriculum and User's Guide to the Starlab and Other Planetariums*, Yulee, FL: Science First.
6. Coyle, H. P., Hines, J. L., Rasmussen, K. J., & Sadler, P. M. (2001). *Challenges in Physical Science: Batteries ST*. Kendall Hunt.
7. Antonucci, Grossman, Sadler, Ward, and Washburn. (2000) *Project ComTech. From Smoke Signals to Fiber Optics: Communicating with Light*. Farmingdale, NY: Kelvin.
8. Antonucci, P. and Sadler, P. M. (2001) *Light, Color and Spectroscopy for Every Classroom*. Tonawanda, NY: Science Kit and Boreal Labs.
9. Sadler, P.M., Sonnert, G. Tai, R.H. & Klopfenstein, K. (2010) *AP: A Critical Examination of the Advanced Placement Program*, Cambridge, MA: Harvard Education Press.

#### BOOKS IN PRESS:

#### EDITORIALS, CONFERENCE PROCEEDINGS AND BOOK CHAPTERS

1. Sadler, Philip. (1986) Astronomy in U.S. High Schools, *COSMOS an Educational Challenge, Proceedings of GIREP*, European Space Agency, Paris, France, 261-63.
2. Sadler, P.M. (1987) Misconceptions in Astronomy, *Proceedings of the Second International Seminar, Misconceptions and Educational Strategies in Science and Mathematics*. (ed) J. Novak, Cornell University, Vol. 3.
3. Sadler, P.M. (1987) Astronomy: Secret Weapon, Focal Point Editorial, *Sky & Telescope*, 452.
4. Whitney, Charles A. & Sadler, P.M. (1989) Intuition-Building Tool Kits for Physical Systems, *Computers in Physics Instruction*, New York: Addison-Wesley Publishing Co., 462-463.
5. Sadler, P.M. (1990) MicroObservatory, *Proceedings of the Eleventh Annual Fairborn/Smithsonian/IAPPP Symposium*, Remote Access Automatic Telescopes.
6. Sadler, P.M. & Luzader, W. (1990) Science Teaching through its Astronomical Roots, *The Teaching of Astronomy*, ed. J. Pasachoff, Cambridge: Cambridge University Press, 1990, 257-276.
7. Sadler, P.M. (1990) Project SPICA, A National Program of Astronomy Workshops, *Proceedings of the International Planetarium Society*.
8. Sadler, P.M. (1990) Project STAR, A High School Astronomy Curriculum, *Proceedings of the International Planetarium Society*.
9. Sadler, P.M. & Brecher, K. (1990) Astronomy as a Laboratory Science, *Proceedings of the Astronomical Society of the Pacific*.
10. Sadler, P.M. (1992) High School Astronomy: Characteristics and Student Learning, *Proceedings of the Workshop on Hands-on Astronomy for Education*, (ed) E. C. Pennypacker, River Edge, NJ: World Scientific.
11. Grossman, M., Sadler, P.M., & Ward, R. B. (1992) A Revolution in Elementary Science. *Harvard University Alumni Bulletin*, 10-12.
12. Sadler, P.M. (1993) Teachers' Misconceptions of their Students' Learning. *Proceedings of the Third International Seminar, Misconceptions and Educational Strategies in Science and Mathematics*. (ed) J. Novak, Ithaca, NY: Cornell University.

13. Sadler, P.M. & Nussbaum, Y. (1993) Focus on Disciplinary Issues: Earth and Space Science. *Proceedings of the Third International Seminar, Misconceptions and Educational Strategies in Science and Mathematics*. (ed) J. Novak, Ithaca, NY: Cornell University.
14. Sadler, P.M. (1995) Astronomy's Conceptual Hierarchy. In *Astronomy Education: Current Developments, Future Coordination* J. Percy (Eds.), San Francisco: Astronomical Society of the Pacific. Vol. 89, 46-60.
15. Sadler, P.M. Celestial Navigation in the Small Planetarium (1995), *Proceedings of the European Meeting of Small and Itinerant Planetariums*, Brescia, Italy: International Planetarium Society, 10/12-16/95.
16. Leiker, P. Steven, Sadler, P.M., & Brecher, K. (1995) The MicroObservatory: An Automated Telescope for Education. *Robotic Telescopes, Astronomical Society of the Pacific Conference Series*, Vol. 79, 93-98.
17. Sadler, P.M. (1998) Twenty Years On The Road: The Portable Planetarium's Development and Contributions to the Teaching of Astronomy. *Proceedings of the International Planetarium Society*, London, England.
18. Sadler, P.M. (1999) The relevance of multiple choice tests in assessing science understanding in *Assessing Science Understanding: A Human Constructivist View* (eds.) J.J. Mintzes, J.H. Wandersee, J.D. Novak. New York: Academic Press, 249-278.
19. Sadler, P.M., Gould, R., Brecher, K., & Hoffman, E. (2000) Astronomical Experiences Using Internet-Accessible Remote Instrumentation in *Innovations in Science and Mathematics Education* (eds.) MJ Jacobson & R. B. Kozma, Mahwah, NJ: Lawrence Erlbaum Assoc., 259-286.
20. Schwartz, M. & Sadler, P.M. (2001) Goals and Technology Education: The Example of Design Challenges. *Proceedings of the Second AAAS Technology Education Research Conference*. 10/16-19, 2001.
21. Sadler, P.M. (2004) Educational Research: the Example of Light and Color. *Proceedings of the NASA Educational Outreach Conference*. Chicago 2002.
22. Tai, R. H. & Sadler, P.M. (2006). Factors influencing college science success. In J. J. Mintzes & W. Leonard, (Eds.), *Handbook of College Science Teaching*. (pp. 359 – 367). Arlington, VA: National Science Teachers Association Press.
23. Marisa Orr, Zahra Hazari, Philip M. Sadler, Gerhard Sonnert. (2009). Career Motivations of Freshman Engineering and Non-Engineering Students: A Gender Study. *Proceedings of the American Society for Engineering Education*.
24. Lung, F., Potvin, G., Sonnert, G. & Sadler, P. (2011) The Effect of Immigration Status on Physics Identity and Physical Science Career Intentions, *Proceedings of the Physics Education Research Conference*, Omaha, NB: 8/3-4/2011.
25. Cass, C.A.P., Hazari, Z. Cribbs, J. Sadler, P.M. Sonnert, G. (2011) Examining the impact of mathematics identity on the choice of engineering careers for male and female students, *Frontiers in Education Conference (FIE)*, Rapid City, SD, F2H1-F2H5.
26. Lung, F., Potvin, G., Sonnert, G., & Sadler, P. M. (2013, January). Welcome to America, welcome to college: Comparing the effects of immigrant generation and college generation on physical science and engineering career. In *AIP Conference Proceedings* (Vol. 1513, p. 270).
27. Udomprasert, P., Goodman, A., Sunbury, S., Zhang, Z., Sadler, P. Dussault, M., Block, S., Lotridge, E., Jackson, J. and Constantin, A-M. (accepted for publication), "Visualizing Moon Phases with WorldWide Telescope." In *ASP Conference Series*.
28. Udomprasert, P., Goodman, A., Zhang, Z. H., Sunbury, S., Sadler, P., Dussault, M., Bloch, S. Lotridge, E., Jackson, J. & Constantin, A. M. (accepted for publication). Visualizing Three-Dimensional Spatial Relationships in Virtual and Physical Astronomy Environments. In *International Conference of the Learning Sciences*.
29. Sonnert, G. & Sadler, P. (2015) *The Impact of Instructor and Institutional Factors on Students' Attitudes in Insights and Recommendations from the MAA National Study of College Calculus*, D. Bressoud, V. Mesa & C Rasmussen, eds., Washington, DC: Mathematics Association of America.
30. Achenbach, G.G., Cintron, L.G., Cohoon, J.M., Sadler, P.M. & Sonnert, G. (2015) Career priorities and the challenge of recruiting women to computing, ASEE Annual Conference and Exposition, Conference Proceedings
31. Goodwin, A., Sonnert, G. & Sadler, P. (2015) The influence of out-of-school high school experiences on engineering identities and career choice, ASEE Annual Conference and Exposition, Conference Proceedings
32. Godwin, A., Scott, T. D., Potvin, G., Sonnert, G., & Sadler, P. M. (2015, October). The academic performance index: Creating a more robust and less biased measure of student academic performance. In *Frontiers in Education Conference (FIE)*, 2015. 32614 2015. IEEE (pp. 1-8). IEEE.

33. Sadler, P. & Sonnert, G. (2016) *The Role of High School Preparation in the Transition to College Calculus*. Invited Talk, MAA Workshop on The Role of Calculus in the Transition from High School to College Mathematics, Conference Proceedings
34. Sadler, P. M., & Sonnert, G. (2016). Understanding Misconceptions: Teaching and Learning in Middle School Physical Science. *American Educator*, 40(1), 26-32.
35. Dabney, K. P., Sonnert, G., Bae, C. L., & Sadler, P. M. (In Review). STEM Experiences and Computer Science Career Interest. Presentation at the 2018 annual American Educational Research Association. New York, NY.
36. Dabney, K. P., \*Johnson, T. N., Hazari, Z., Dou, R., Sonnert, G., & Sadler, P. M. (April, 2017). Elementary, Middle, and High School Out-of-School Time Science Experiences and STEM Career Interest. Presentation at the 2017 annual American Educational Research Association. San Antonio, TX.
37. \*Johnson, T. N., Dabney, K. P., Hazari, Z., Sonnert, G., & Sadler, P. M. (April, 2017). The Association Between K-12 Out-of-School Time Science and STEM Identity at the Beginning of College. Presentation at the 2017 annual American Educational Research Association. San Antonio, TX.
38. Dabney, K. P., Sadler, P. M., & Sonnert, G. (April, 2016). Out-of-School Time Science Activities and Their Association with Female Career Interest in STEM. Presentation at the 2016 annual American Educational Research Association. Washington, D.C.

#### REFEREED ARTICLES

1. Lightman, A. & Sadler, P.M. The Earth is Round? Who Are You Kidding? *Science and Children*, February 1988. 24-26.
2. Sadler, P.M. (1990) William Pickering's Search for a Planet Beyond Neptune. *Journal for the History of Astronomy*, 21(1), 59-64.
3. Sadler, P.M. (1991) Projecting Spectra for Classroom Investigations, *The Physics Teacher*, 29(7), 423-427.
4. Lightman, A. & Sadler, P.M. (1993) Teacher Predictions versus Actual Student Gains. *The Physics Teacher*, 31(3), 162-167.
5. Sadler, P.M. (1995) An Ancient Time Machine: The Dial of Ahaz, *American Journal of Physics*, 33(3), 211-216
6. Sadler, P.M. & Tai, R. H. (1997) The Role of High School Physics in Preparing Students for College Physics. *The Physics Teacher* 35(5), 282-285.
7. Sadler, P.M. (1998) Psychometric Models of Student Conceptions in Science: Reconciling Qualitative Studies and Distractor-Driven Assessment Instruments, *Journal of Research in Science Teaching*, 35(3), 265-296.
8. Sadler, P.M. & Hammerman, J. (1999). Employing Quantitative Models of a Qualitative Admission Process: Uncovering Hidden Rules, Saving Time, and Reducing Bias, *College & University*, 74(3), 8-23.
9. Sadler, P.M., Whitney, C.A., Shore, L. & Deutsch, F. (1999) Visualization and Representation of Physical Systems: Wavemaker as an Aid to Conceptualizing Wave Phenomena, *Journal of Science Education and Technology*, 8(3), 197-209.
10. Sadler, P.M., Doug Haller, & Eliza Garfield. (2000) Observational Journals: An Aid to Sky Watching. *Journal of College Science Teaching*, 29(4), 245-254.
11. Sadler, P.M., Coyle, H.A. & Schwartz, M., (2000) Successful Engineering Competitions in the Middle School Classroom: Revealing Scientific Principles through Design Challenges, *Journal of the Learning Sciences*. 9(3), 299-327.
12. Sadler, P.M. & Tai, R.H. (2001) Success in College Physics: The Role of High School Preparation, *Science Education*. 85:2, 111-136.
13. Sadler, P.M., Roy Gould, P. Steven Leiker, Paul Antonucci, Robert Kimberk, Freeman Deutsch, & Beth Hoffman. (2001) MicroObservatory Net: A network of automated remote telescopes dedicated to educational use. *Journal of Science Education and Technology*. 10(1), 39-55.
14. Tai, R. H. & Sadler, P. M. (2001) Gender Differences in Introductory Undergraduate Physics Performance: University Physics and College Physics in the United States. *International Journal of Science Education*, 1017-1037.

15. Libarkin, J. C., Crockett, C.D. & Sadler, P.M. (2003) Density on Dry Land: Demonstrations Without Buoyancy Challenge Student Misconceptions. *The Science Teacher*, 70(6), 46-50.
16. Tai, R. H., Sadler, P.M., & Loehr, J. F. (2005). Factors influencing success in introductory college chemistry. *Journal of Research in Science Teaching*. 42 (9), 987-1012.
17. Sadler, P.M. & Good, E. (2006) Substituting Self- and Peer-Grading for Teacher-Grading of Tests and its Impact on Student Learning. *Educational Assessment*, 11(1), 1-31.
18. Dexter, K. M., Tai, R. H., & Sadler, P.M. (2006). Traditional and block scheduling for college science preparation: A comparison of college science success of students who report different high school scheduling plans. *High School Journal*. 89(4), 22 – 33.
19. Tai, R. H., Sadler, P.M., & Mintzes, J. J. (2006). Factors influencing college science success. *Journal of College Science Teaching*. 35(8), 56 – 60.
20. Tai, R. H., Ward, R. B., & Sadler, P.M. (2006). High school chemistry content background of introductory college chemistry students and its association with college chemistry grades. *Journal of Chemical Education*. 83(11), 1703 – 1711.
21. Gould, R., Dussault, M. Sadler, P. (2006). What's educational about online telescopes? Evaluating ten years of MicroObservatory, *Astronomy Education Review*. 5(2). 1-19.
22. Tai, R. H., Sadler, P. M., & Loehr, J. F. (2006). Influencing college chemistry success through high school chemistry teaching. *The Science Education Review*, 5, 123-127.
23. Maltese, A. V., Tai, R. H., & Sadler, P.M. (2007). Breaking from tradition: Unfulfilled promises of block scheduling in science. *Science Educator*, 16(1), 1-7.
24. Sadler, P.M. & Tai, R. H. (2007). Weighting for recognition: Accounting for Advanced Placement and honors courses when calculating high school grade point average. *National Association of Secondary School Principals Bulletin*. 91(1), 5-31.
25. Tai, R. H. & Sadler, P.M. (2007). High school chemistry instructional practices and their association with college chemistry grades. *Journal of Chemical Education*.
26. Wyss, V. L., Tai, R. H., & Sadler, P.M. (2007). High school class-size and college performance in science. *High School Journal*. 90(3), 45-53.
27. Schwartz, M. S. & Sadler, P.M. (2007) Empowerment in Science Curriculum Development: A microdevelopmental approach. *International Journal of Science Education*. 29(18), 987-1017.
28. Hazari, Z. S., Tai, R. H., & Sadler, P.M. (2007). Gender differences in introductory university physics performance: The influence of high school physics preparation and affect. *Science Education*. 1-30.
29. Sadler, P.M. & Tai, R. H. (2007) The Two High-School Pillars Supporting College Science. *Science*. 317(5837) 457-458.
30. Sadler, P.M. & Tai, R. H. (2007). Accounting for Advanced High School Coursework in College Admission Decisions, *College & University*, 82(4), 7-14.
31. Sadler, P.M. & Tai, R. H. (2007). Advanced Placement exam scores as a predictor of performance in introductory college biology, chemistry, and physics courses. *Science Educator*, 16(1). 1-19.
32. Ward, R. B., Sadler, P.M., & Shapiro, I.I. (2007). Learning Science Through Astronomy Activities: A Comparison Between Constructivist and Traditional Approaches in Grades 3-6. *Astronomy Education Review*, 6(2), 1-19.
33. Tai, R. H., Sadler, P.M. & Maltese, A. V. (2007). A study of the association of autonomy and achievement on performance. *Science Educator*, 16(1), 22-28.
34. Schwartz, M., Hazari, Z. & Sadler, P.M. (2008). Divergent views: Teacher and Professor Perceptions about Pre-College Factors that Influence College Science Success. *Science Educator*. 17(1), 18-35.
35. Hazari, Z., Sadler, P.M., & Tai, R.H. (2008) Gender Differences in the High School and Affective Experiences of Introductory College Physics Students, *The Physics Teacher*, 46, 423-427.
36. Tai, R. H. & Sadler, P.M. (2009). Same science for all? Interactive association of structure in learning activities and academic attainment background on college science performance in the USA. *International Journal of Science Education*, 31(5), 675-696.
37. Schwartz, M., Sadler, P.M., Sonnert, G., & Tai, R.H. (2009) Depth Versus Breadth: How Content Coverage in High School Science Relates to Later Success in College Science Coursework. *Science Education*, 93(4), 798-826.
38. Plotkin, G, Hazari, Z., & Sadler, P.M., (2009) Unraveling Bias from Student Evaluations of their Science Teachers, *Science Education*, 93(4), 827-845.

39. Sadler, P., Coyle, H., Miller, J. Cook-Smith, N., Dussault, M. & Gould, R (2009) The Astronomy and Space Science Concept Inventory: Development and Validation of an Assessment Instrument Aligned with the National Standards, *Astronomy Education Review*, 8(1), 1-26. <http://dx.doi.org/10.3847/AER2009024>
40. Sadler, P.M. & Night, C. (2010) Daytime Celestial Navigation for the Novice. *The Physics Teacher*, 48(3), 197-199.
41. Maltese, A. V., Tai, R. H., & Sadler, P.M. (2010). The Effect of High School Physics Laboratories on Performance in Introductory College Physics, *The Physics Teacher*, 48(5), 333-337.
42. Hazari, Z., Sonnert, G., Sadler, P. M., & Shanahan, M.C. (2010) Connecting High School Physics Experiences, Outcome Expectations, Physics Identity, and Physics Career Choice: A Gender Study, *Journal of Research in Science Teaching*, 47(8), 978-1003.
43. Loehr, J. F., Tai, R. H., & Sadler, P.M. (2011) High school and college biology: A multi-level model of the effects of high school courses on introductory course performance, *Journal of Biological Education*, 1-8.
44. Libarkin, J.C, Asghar, A, Crockett, C. & Sadler, P.M. (2011) Invisible Misconceptions: Student understanding of ultraviolet and infrared radiation, *Astronomy Education Review*, 10(1), <http://dx.doi.org/10.3847/AER2011022>
45. Dabney, K. P, Almarode, J.T., Miller-Friedmann, J.L., Tai, R.H., Sonnert, G. & Sadler, P.M. (2011) Out-of-School Time Science Activities and Their Association with Career Interest in STEM, *International Journal of Science Education, Part B*, 2(1). DOI: 10.1080/21548455.2011.629455
46. Sadler, P.M. Garfield, E.N, Tremblay, A. & Sadler, D.J., (2012) Inertial Navigation: A Bridge Between Kinematics and Calculus, *The Physics Teacher*, 50, 360-362.
47. Mackin, K.J., Cook-Smith, N., Illari, L., Marshall, J. & Sadler, P. (2012) The Effectiveness of Rotating Tank Experiments on Undergraduate Student Learning in Atmospheric and Oceanic Science Courses. *Journal of Geoscience Education*. 60(1), 67-82. DOI: 10.5408/10-194.1
48. Sadler, P.M., Sonnert, G., Hazari, Z., & Tai, R.H. (2012) Stability and Volatility of STEM Career Interest in High School: A Gender Study, *Science Education*. 96(3), 411-427. DOI: 10.1002/sce.21007
49. Barnett, M. D., Sonnert, G. & Sadler, P. M. (2012). More Like Us: The Effect of Immigrant Generation on College Success in Mathematics. *International Migration Review*. 46(4), 891-918.
50. Sonnert, G., Sadler, P., & Michaels, M. (2013). Gender Aspects of Participation, Support, and Success in a State Science Fair. *School Science and Mathematics*, 113(3), 135-143.
51. Sadler, P., Sonnert, G., Coyle, H., Miller, J. & Cook-Smith, N. (2013) The Influence of Teachers' Subject Matter Knowledge and Pedagogical Content Knowledge on Student Learning in Middle-School Physical Science Classrooms, *American Education Research Journal*, 50(5), 1020-1049.
52. Hazari, Z., Sonnert, G. & Sadler, P. M. (2013) The Science Identity of College Students: Exploring the Intersection of Gender, Race, and Ethnicity, *Journal of College Science Teaching*, 42(5), 46-55.
53. Sadler, P., Coyle, H., Cook-Smith, N., Miller, J., Mintzes, J., Tanner, K. & Murray, J. (2013). Assessing the Life Science Knowledge of Students and Teachers Represented by the K-8 National Science Standard, *CBE Life Science Education*. 12(3), 553-575.
54. Ward, R. B., Sienkiewicz, F., Sadler, P., Antonucci, P., & Miller, J. (2013). Exploring the Hidden Structure of Astronomical Images: A "Pixelated" View of Solar System and Deep Space Features! *Astronomy Education Review*, 12, 010204.
55. Hazari, Z., Potvin, G., Lock, R. M., Lung, F., Sonnert, G., & Sadler, P. M. (2013). Factors that affect the physical science career interest of female students: Testing five common hypotheses. *Physical Review Special Topics-Physics Education Research*, 9(2), 020115.
56. Schneps, M.H., Ruel, J. Sonnert, G., Dussault, M. Griffin, M. & Sadler, P.M. (2014) Conceptualizing astronomical scale: virtual simulations on handheld tablet computers reverse misconceptions, *Computers and Education*, 70, 269-280.
57. Barnett, M., Sonnert, G. & Sadler, P. (2014) Productive and Ineffective Efforts: How Student Effort In High School Mathematics Relates to College Calculus Success. *International Journal of Mathematical Education in Science and Technology*, 45(7), 996-1020.
58. Sadler, P., Sonnert, G, Hazari, Z. & Tai, R. (2014) The Role of High School Coursework in Increasing STEM Career Interest, *Science Educator*, 23(1), 1-20.
59. Sonnert, G., & Sadler, P. M. (2014). The impact of taking a college pre-calculus course on students' college calculus performance. *International Journal of Mathematical Education in Science and Technology*, 45(8), 1188-1207.
60. Sonnert, G., Sadler, P. M., Sadler, S. M., & Bressoud, D. M. (2015). The impact of instructor pedagogy on college calculus students' attitude toward mathematics. *International Journal of Mathematical Education*

in *Science and Technology*, 46(3), 370-387.

61. Wilkens, C. P., Wade, C. H., Sonnert, G., & Sadler, P. M. (2015). Are Homeschoolers Prepared for College Calculus? *Journal of School Choice*, 9(1), 30-48.
62. Cribbs, J., Hazari, Z., Sonnert, G. & Sadler, P. (2015) Establishing an Explanatory Framework for Mathematics Identity, *Child Development*, 86(4), 1048-1062.
63. Fuchs, T., Sonnert, G. & Sadler, P. (2015) High School Predictors of a Career in Medicine, *Journal of Career and Technical Education*, 30(1), 9-28.
64. Cribbs, J., Cass, C., Hazari, Z., Sadler, P. & Sonnert, G. (2016) Mathematics Identity and Student Persistence in Engineering, *International Journal of Engineering Education*, 32, (1A), 1-9.
65. Wade, C., Sonnert, G., Sadler, P., Hazari, C. & Watson, C. (2016) A Comparison of Mathematics Teachers' and Professors' on Preparation for Tertiary Calculus, *Journal of Mathematics Education at Teachers College*, 7(1), 7-16.
66. Bergstrom, Z., Sadler, P., & Sonnert, G. (2016). Evolution and Persistence of Students' Astronomy Career Interests: A Gender Study. *Journal of Astronomy & Earth Sciences Education (JAESE)*, 3(1), 77-92.
67. Mao, Y., White, T., Sadler, P.M., & Sonnert, G. (2016) The Impact of Pre-College Use of Calculators on Student Performance in College Calculus, *Educational Studies in Mathematics*, 94(1), 69-83.
68. Sadler, P., Sonnert, G., Coyle, H. & Miller, K. (2016) Identifying Promising Items: The Use of Crowdsourcing in the Development of Assessment Instruments, *Educational Assessment*, 21(3), 196-214.
69. Goodwin, A. Sadler, P. & Sonnert, G. (2016) Disciplinary Differences in Out-of-School High School Science Experiences and Influence on Students' Engineering Choices, *Journal of Pre-College Engineering Education Research*, 6(2), 26-39.
70. Sonnert, G., Barnett, M. & Sadler, P (2016) Individual and Neighborhood Effects of Race/Ethnicity and Socioeconomic Status on Participation and Performance in College Calculus, *Journal of Women and Minorities in Science and Engineering*, 22(4), 281-307.
71. Wade, C., Sonnert, G., Sadler, P. & Hazari, C. (2017) Instructional Experiences that Align with Conceptual Understanding in the Secondary-Tertiary Transition to College Calculus, *American Secondary Education Journal*, 45(2), 4-21.
72. Wade, C. H., Sonnert, G., Wilkens, C. P., & Sadler, P. M. (2017). High School Preparation for College Calculus: Is the Story the Same for Males and Females?. *The High School Journal*, 100(4), 250-263.
73. Miller, K., Sonnert, G. & Sadler, P. (2017) The Influence of Students' Participation in STEM Competitions on Their Interest in STEM Careers, *International Journal of Science Education, Part B*. 1-20.
74. Dabney, K. P., Johnson, T., Sonnert, G., & Sadler, P. M. (2017). STEM career interest in women and informal science experiences. *Journal of Women and Minorities in Science and Engineering*. 23(3), 249-270.
75. Sadler, P. & Sonnert, G. (2018) The Path to College Calculus: The Impact of High School Coursework, *Journal for Research in Mathematics Education*. 49(3), 292-330.

#### ARTICLES IN PRESS

76. Sonnert, G., Barnett, M. & Sadler, P (in press) Short-term and long-term consequences of a focus on standardized testing in AP calculus classes, *The High School Journal*
77. Kitchen, J. A., Sadler, P.M. & Sonnert, G. (in press) The Impact of College- and University-Run High School Summer Programs on Students' End of High School STEM Career Aspirations, *Science Education*
78. Hansen, J., Sadler, P. M., & Sonnert, G. (in press). Estimating High School GPA Weighting Parameters with a Graded Response Model. *Educational Measurement: Issues and Practice*
79. Kitchen, J. A., Sadler, P.M. & Sonnert, G. (in press) The Impact of Summer Bridge Programs on College Students' STEM Career Aspirations" *Journal of College Student Development*

#### ARTICLES REVISED AND RESUBMITTED

#### ARTICLES BEING REVISED FOR RESUBMISSION

1. Sadler, P., Where are we? Finding Your Location with Celestial Navigation, submitted to *The Science Teacher*.



2. Watson, C., Hazari, C., Sonnert, G. & Sadler, P. Understanding Disadvantage: Using Matching to Account for Black and White Performance Differences in Calculus. Submitted to *Journal of Research in Math Education*.
3. Sonnert, G., Hazari, Z. & Sadler, P. Evaluating the quality of middle school mathematics teachers, using videos rated by college students, *Studies in Educational Evaluation*
4. Kitchen, J. A., Sadler, P.M. & Sonnert, G. Campus Visits: Impact of a College Outreach Strategy on Student STEM Aspirations, *Journal of Student Affairs: Research and Practice*

#### **ARTICLES UNDER REVIEW**

1. Dou, R, Hazari, Z., Dabney, K.P., Sonnert, G., & Sadler, P.M. The effects of early informal STEM experiences on STEM identity: The importance of talking science, *Science Education*
2. Chen C., Haduong, P., Brennan, C., Sonnert, G. & Sadler, P. The Effects of First Programming Language on College Students' Computing Attitude and Achievement: A Comparison of Graphical and Textual Languages, *Computers & Education*

#### **ARTICLES IN PREPARATION**

1. Sadler, P., Sonnert, G., Garfield, Coyle, H., Cook-Smith, N., Miller, J. & Murray, J. How the Attributes of Middle School Professional Development Institutes in Life Science Impact Gains in Teachers' Subject Matter Knowledge.
2. Hazari, Z., Sadler, P. M., Sonnert, G., & Carolina, S. Examining the Relationship between Single-Sex Experiences in High School Science and Science Career Choice.
3. Dou, R., Hazari, Z., Dabney, K. P., Sonnert, G., & Sadler, P. M. (In Preparation). Talking science: Experiences that predict STEM identity and career goals. *Science Education*.

## **SPONSORED RESEARCH GRANTS**

Role	Name	Project	\$M	Funding Institution	Years
PM	STAR	Project STAR - development of high school level astronomy course		NSF, Materials Development	1985-1991
PM	SPICA	Project SPICA - summer institutes to train astronomy workshop leaders (with Linda French and Darrel Hoff)		NSF, Teacher Enhancement	1989-1994
Co-I	InSIGHT	InSIGHT - development of advanced simulations for introductory physics		NSF, Applications of Advanced Tech	1989-1995
Co-I	$\mu$ Obs	MicroObservatory - development of low-cost electronic telescope for school use		NSF, Applications of Advanced Tech	1989-1992
Co-I	ARIES	Project ARIES, elementary school astronomy curriculum		NSF, Materials Development	1992-99
PI	APU	A Private Universe Project Manual		Annenberg/CPB	1993
PI	$\mu$ Obs II	MicroObservatory II - development of low-cost electronic telescope for school use		NSF Applications of Advanced Tech	1992-1995
Co-I	MVP	Misconception Video Project - documentary film on student conceptions in science		NSF, Teacher Enhancement, Annenberg/CPB	1993-1997
PI	$\mu$ ObsNet	MicroObservatory Net	1.312	NSF, Applications of Advanced Tech	1995-1998
PI	ITS	A Design for an Interactive Television Series: Children's Science Television Founded on Constructivist Research	0.731	NSF, Informal Science Education, US Dept of Commerce	1995-1998
PI	Comparative Analysis	Comparative Analysis of: NELS 88, Decisions Pilot Study and TIMSS Data in Physics Education and Achievement	0.029	NSF, Research and Studies	1996-1998
PI	Spectroscopy	Spectroscopy: The Universal Analytic Method	0.411	NSF, Materials Development	1996-2000
PI	ComTech	Communication Technology	0.373	NSF, ATE division	1997-2000
PI	DESIGNS I & II	Middle school engineering curriculum	3.022	NSF, Materials Development	1995-2002
PI	SEDNet I & II	A Nationwide Educational Leadership Program	2.476	NSF, Teacher Enhancement	1998-2004
Co-I	$\mu$ Obs Curriculum	From the Ground Up, MicroObservatory Curriculum Development	0.895	NSF, Materials Development	1998-2002
PI	DDMC	Study and Development of Distractor-Driven Multiple-Choice Tests Aligned to the National Science Standards	0.250	NSF, Research on Learning and Education	2001-2003
PI	FICSS	Factors Influencing College Science Success	3.042	Interagency Educational Research Initiative (NSF, DoEd, NIH)	2001-2006
PI	MOSART	Misconception Oriented Standards-based Assessment Resource for Teachers	2,813	NSF, Math Science Partnerships, Research, Education and Technical Assistance	2004-2009

PI	SPARCS	Standards- and Preconceptions-Based Assessment of Reform Curricula in Science & Supplement	1.185	NSF, Materials Development	2004-2007
PI	PRiSE	Persistence Research in Science and Engineering	0.494	NSF, Research on Gender in Science and Engineering	2006-2009
PI	AP Synthesis	Synthesis of Research on Advanced High School Coursework in Science and Mathematics,	0.199	NSF, Research on Learning and Education	2006-2008
PI	SPARCS HS	Evaluation of HS Science Courses	0.409	NSF, Discovery Research K-12	2007-2009
PI	MOSART LS	Misconception Oriented Standards-based Assessment Resource for Teachers of Life Science	1.413	NSF, Math Science Partnerships, Research, Education and Technical Assistance	2008-2012
PI	FICSMath	Factors Influencing College Success in Mathematics	1.099	NSF, Research on Learning and Education	2008-2012
PI	ITEST Strat	ITEST Strategies	1.499	NSF, Research on Learning in Formal and Informal Settings, ITEST	2008-2013
PI	MOSART-II	Misconception Oriented Standards-based Assessment Resource for Teachers	1.193	NSF, Math Science Partnerships, Research, Education and Technical Assistance	2009-2013
PI	ALSISE	Assessment of Life Science Intermediate School Educators	0.9	NIH, Challenge Grants In Health And Science Research	2009-2012
PI	OPSCI	Outreach Programs and Science Career Intentions	1.135	NSF, Science, Technology, Engineering, and Mathematics Talent Expansion Program	2012-2017
PI	ITEST Long	EAGER: ITEST Longitudinal Study	0.168	NSF, DRL, Discovery Research K-12	2013-2015
PI	SOCSMOOC	EAGER: Student Outcomes in a Computer Science MOOC	0.299	NSF, DUE, TUES-Type 1 Project	2013-2015
PI	OPSMOOC	Outcome Predictions of Students in Massive Open Online Courses	0.249	NSF, DRL, Program Evaluation	2013-2015
PI	MOSART HSLS	Misconceptions Oriented Standards-Based Assessment Resource for Teachers of High School Life Science	2.849	NSF, DRL, Discovery Research K-12	2013-2016
PI	FICSIT	Factors Influencing College Success in Information Technology	0.599	NSF, CER	2013-2016
PI	ITEAMS II	Innovative Technology-Enabled Astronomy for Middle Schools II	0.609	NSF, Research on Learning in Formal and Informal Settings, ITEST	2014-2017
PI	PDMOST	Professional Development Models and Outcomes for Science Teachers	2.175	NSF, DRL, Discovery Research K-12	2014-2017
PI	FROSTS	Collaborative Research: Female Representation in Out-of-School-Time Science	1.100	NSF, Advancing Informal STEM Learning	2016-2019
PI	MOSART HS PS	Misconceptions Oriented Standards-Based Assessment Resource for	2.648	NSF, DRL, Discovery Research K-12	2016-2019

		Teachers of High School Physical Sciences			
PI	WWT	Thinking Spatially about the Universe- A Physical and Virtual Laboratory for Middle School Science (SAO Part of A. Goodman's Project)	.149	NSF, DRL, Discovery Research K-12	2015- 2018

## COURSES TAUGHT

	<i>Astronomy 2</i>	<i>T-210e</i>	<i>T-211e</i>	<i>T-215</i>	<i>T-124</i>	<i>Astronomy 302</i>
Course Title	Celestial Navigation	Module on Teaching Science	Module on Teaching Science	Teaching Science	How Children Learn Science	Scientists Teaching Science
Enrollment	FAS & GSE	GSE, TEP.	GSE, TEP.	GSE, TEP.	GSE	FAS
Class Hrs/wk	5.0	1.25	1.25	2.5 ->3.0	2.0	2.5
1989-90	Spring					
1990-1991	Fall, Spring					
1991-1992	Fall					
1992-1993	Fall	Fall	Spring			
1993-1994	Fall	Fall	Spring		Spring	
1994-1995	Fall			Fall	Spring	
1996-1997	Spring			Fall		
1997-1998				Fall	Spring	
1998-2000	Spring			Fall	Spring	
2000-2002	Spring					
2002-2018	Fall					Spring

## CONFERENCE PAPERS AND WORKSHOPS

- 7/1/86, International Planetarium Society Conference, Tucson, AZ, Contributed workshop: "Activities for Teaching Astronomical Scale."
- 1/31/87, American Association of Physics Teachers, San Francisco, CA, Contributed Papers: "Studying Terrestrial Spectra", "Misconceptions about Astronomy", "The State of High-School Astronomy Education".
- 5/2/87, Massachusetts Association of Science Supervisors, Framingham, MA, Invited paper: "Starting an Astronomy Course in Your School."
- 5/28/87, Macademia, Boston College, Boston, MA. Invited Paper: "Microcomputer-based Simulations in Astronomy."
- 6/25/87, The Independent School Association of Massachusetts, Wellesley, MA, Invited Workshop: "Scale Models in Astronomy".
- 7/15/87, Astronomical Society of the Pacific, Pomona, CA, Invited Paper: "Commonly Held Misconceptions in Astronomy".
- 8/12/87, National Air and Space Museum, Practical Astronomy: Time, Place, and Space Teacher Workshop, Washington, DC, Invited Workshop: "Where We are in Space and Time".
- 11/6/87, National Science Teachers Association Regional Conference, Pittsburgh, PA, Contributed Paper: "Activities for Teaching Astronomy."
- 11/21/87, National Air and Space Museum, Practical Astronomy: Time, Place, and Space Teacher Workshop, Washington, DC, Invited Workshop: Activities from, "Where We are in Space and Time".
- 4/7/88, National Science Teachers Association, St. Louis, MO. Contributed Workshops: "Astronomy Share-A-Thon: A National Earth Science Teachers-Association of Astronomy Educators Workshop"
- 4/8/88, National Science Teachers Association, St. Louis, MO. "What's Up? Bringing the Universe into Your Classroom."
- 6/19/88, The Independent School Association of Massachusetts, Wellesley, MA, Contributed Workshop: "Elementary Astronomy Activities".
- 7/7/88, Woodrow Wilson National Fellowship Foundation, Institute on High School Physics, Princeton, NJ, Workshop: "Activities for Teaching about Light.
- 8/17/88, National Air and Space Museum, Washington, DC, Invited Workshop: "Middle School Astronomy Activities."
- 4/28/89, Science Museum of Virginia, Science Sense Advisory Committee Meeting, Richmond, VA Invited Workshop: "Building Conceptual Understanding in Astronomy".

16. 6/18/89, Independent School Association of Massachusetts, Summer Workshops for Independent School Teachers, Wellesley, MA, Workshop for Elementary School Teachers: "Strengthening the K-8 Classroom through Science."
17. 4/5/90, National Science Teachers Association National Convention, Atlanta, GA, Contributed Workshop: "Project STAR: Science Teaching through its Astronomical Roots"
18. 4/6/90, National Science Teachers Association National Convention, Atlanta, GA, Contributed Workshop: "What's Up? Bringing the Universe into Your Classroom, 10th Anniversary Gala," (with Darrel Hoff).
19. 7/16/90, International Planetarium Society, Borlange Conference. Invited Workshop: "Hands-On Methods in Portable Planetariums."
20. 11/1/91, Science Teachers Association of Ontario,. Invited Workshop: "Activity-Based Astronomy Teaching."
21. 3/26/92, National Science Teachers Association, Boston, A, , "Astronomy Share-a-thon," "Association of Astronomy Educators Workshop."
22. 6/25/92, International Planetarium Society, Salt Lake City, Workshop: "Teaching Celestial Navigation in the Planetarium," and "Activities from Project STAR."
23. 6/29/92, NSF, Applications of Advanced Technology Meeting, Washington, DC. Invited Paper: "The Potential for Student Research with MicroObservatory"
24. 6/29/92, NSF, Applications of Advanced Technology Meeting, Washington, DC. Invited Paper: "Simulations and the Role of the Laboratory in Teaching Physics."
25. 7/16/92, Lawrence Hall of Science, Participatory Oriented Planetarium Institute, University of California, Berkeley. Workshop: "Astronomical Misconceptions and Scale Model Activities."
26. 11/3/92, Workshop for Hands-on Astronomy for Education, Tucson: Fairborn Observatory. Invited Paper: "High School Astronomy: Characteristics and Student Learning."
27. 2/10/93, NSF Invitational Conference, Washington, DC. Invited Paper: "Project STAR, A Curriculum that Changes Students Misconceptions."
28. 2/13/93, American Association for the Advancement of Science, Boston. Poster Session: "Science Education Projects at the Harvard-Smithsonian Center for Astrophysics."
29. 3/4/93, Schlumberger-Doll Research Symposium, Wallingford, CT. Invited Paper: "Children's Ideas in Science."
30. 4/1/93, National Science Teachers Association, St. Louis, MO. Workshop: "Project SPICA Activities."
31. 4/1/93, National Science Teachers Association, St. Louis, MO. April 1, 1993. Workshop: "Project SPICA Activities."
32. 6/14/93, Astronomical Society of the Pacific, San Deigo, CA. Keynote: "Astronomical Misconceptions. Update on MicroObservatory."
33. 6/29/93, NSF, Applications of Advanced Technology Meeting, Washington, , Invited Paper: "The Progress of MicroObservatory and InSIGHT Simulations."
34. 7/14/93, Astronomical Society of the Pacific, San Deigo, Invited Workshop: "Astronomy Education."
35. 7/20/93, Lawrence Hall of Science, Astronomy and Space Science Summer Institute, U Cal, Berkeley, Workshop: "Children's Astronomical Ideas and their Origins."
36. 8/3/93, Third International Seminar, Misconceptions and Educational Strategies in Science and Mathematics. Cornell University,. Contributed Paper: "Teachers' Misconceptions of their Students' Learning"
37. 8/3/93, Third International Seminar, Misconceptions and Educational Strategies in Science and Mathematics. Cornell University,. Contributed Paper: "The Private Universe Project (with Matt Schneps)."
38. 9/18/93, Technical Education Research Center, Cambridge, MA. Colloquium: "Mouselab: Microcomputer Based Laboratories without Transducers."
39. 1/29/94, Center for the Enhancement of Science and Mathematics Education Statewide Implementation Conference, Northeastern University, Boston, MA. Invited Talk: "The Lessons of Project STAR."
40. 6/7/94, NSF, Applications of Advanced Technology, Washington, DC. Invited Paper: "Remote Telescopes Over the Internet."
41. 6/15/94, National Educational Computer Conference, Boston, MA. Invited Paper: "MicroObservatory, Computer Animation of Small Telescopes (with Kenneth Brecher, Boston University)."
42. 7/13/94, International Planetarium Society, Cocoa Beach, FL. Invited Paper: "Astronomical Misconceptions."
43. 1/18/95, American Association of Physics Teachers Conference, Orlando, FL. Invited Paper: "The Effects of High School Preparation on College Physics Success"
44. 1/18/95, American Association of Physics Teachers Conference, Orlando, FL. Invited Paper: "Mouselab -- A Program for Learning About Kinematics (with Freeman Deutsch, CfA)

45. 1/18/95, American Association of Physics Teachers Conference, Orlando, FL. Invited Paper: "Student Misconceptions and the Introductory Astronomy Course."
46. 3/23/95, National Science Teachers Association Conference, Philadelphia, PA.. Workshop: "Using the MicroObservatory (with Steve Leiker)."
47. 6/24/95, Astronomical Society of the Pacific, College Park, MD. Invited paper: "Astronomy's Conceptual Hierarchy."
48. 7/28/95, National Science Teachers Association Conference, Coho Rios, Jamaica,. Invited Workshop: "Size and Scale in the Universe: Children's Ideas and How They Change."
49. 10/12/95, International Planetarium Society, Conference on Portable and Itinerant Planetariums, Lumezzane, Italy. Invited Paper: "Teaching Navigation in the Planetarium."
50. 3/28/96, National Science Teachers Association Conference, St. Louis, MO. Short Course: "The Private Universe Project (with Nancy Finkelstein, CfA)."
51. 4/1/96, International Technology Education Association Conference, Phoenix, AZ. Panel Presentation; "Technology Materials in Support of Educational Reform (with Gerhard Salinger, NSF)."
52. 5/9/96, Middle Atlantic Planetarium Conference, Boston, MA. Workshop: "Celestial Navigation in the Small Planetarium."
53. 6/15/96, First Science Centre World Congress, Vantaa, Finland. Panel Presentation: "(with Lars Broman, Per Broman, and Susan Reynolds) Mobile Planetaria."
54. 6/20/96, NSF State Systemic Initiatives, Washington, DC. Invited Exhibit "The Private Universe Project (with Matt Schneps)."
55. 6/27/96, NSF, Applications of Advanced Technologies, Component Software and Software Tools, Washington DC. Invited Talk: "The MicroObservatory Network of Telescopes."
56. 7/7/96, International Astronomical Union Education Colloquium, London, England. Invited paper: "MicroObservatory (with Kenneth Brecher, BU)"
57. 7/7/96, International Astronomical Union Education Colloquium, London, England. Invited paper: "What to Cover and When: Using the Prerequisite Nature of the Astronomical Ideas."
58. 8/7/96, American Association of Physics Teachers Conference, College Park, MD, Invited Papers: "Middle School Design Projects (with Marc Schwartz, GSE Ed.D. student)"
59. 8/7/96, American Association of Physics Teachers Conference, College Park, MD, Invited Papers: "Physics Performance Factors (with Robert Tai, GSE Ed.D. student)"
60. 8/7/96, American Association of Physics Teachers Conference, College Park, MD, Invited Papers: "Spectroscopy -- The Universal Analytical Method (with Paul Antonucci, CfA)."
61. 8/7/96, American Association of Physics Teachers Conference, College Park, MD, Invited Papers: "Automated Telescopes on the Internet (with Roy Gould, CfA)"
62. 12/13/96, NSF Design Education Workshop, Technical Education Research Center, Cambridge, MA. Invited Talk: "Project DESIGNS: Early Results."
63. 1/4/97, American Association of Physics Teachers, Phoenix, AZ, Invited Paper: "Students' Astronomical Conceptions and How They Change."
64. 2/28/97, Optical Society of America, New England Section, Waltham, MA. Invited Talk: "Bringing the Rainbow Down to Earth."
65. 3/16/97, National Zoological Park, Smithsonian Institution, Washington DC. Invited Talk: "Dialogue II: What About Diffusion? What Drives Outreach?"
66. 4/5/97, National Science Teachers Association Conference, New Orleans, LA. Workshop: "DESIGNS Challenges."
67. 6/14/97, 4th International Seminar, Misconceptions and Educational Strategies in Science and Mathematics, Cornell University. Contributed Paper: "The Role of Misconceptions in the Evolution of Children's Ideas."
68. 9/24/97, The National Academy of Education, National Meeting, Boulder, CO, September 24, 1997. "What Does It Mean to Know?"
69. 4/16/98, National Science Teachers Association Conference, Anaheim, CA. Workshop: "Teaching Physical Science with Design Challenges."
70. 4/20/98, National Association for Research in Science Teaching, San Diego. Contributed Paper: "Reconciling Qualitative and Quantitative Investigations of Students' Scientific Understanding Using Psychometric Measures."
71. 5/2/98, American Physical Society — American Association of Physics Teachers Regional Meeting. Ball State University. Invited Talk: "Misconceptions in Physics."



72. 6/28/98, International Planetarium Society, London, England. "Twenty Years On The Road: The Portable Planetarium's Development And Contributions To The Teaching Of Astronomy."
73. 11/5/98, VermontFest: Keynote: "The Role of Technology in Professional Development."
74. 12/1/98, Lowell Regional Physics Alliance. University of Massachusetts, Lowell. Invited talk: "The Role of High School Physics in Preparing Students for College Physics."
75. 7/2/99, Astronomical Society of the Pacific, Annual Conference, Toronto, Ont. Invited Paper: "Effective Learning of Astronomy."
76. 11/8/99, Harvard Graduate School of Education, Cambridge, MA. Creationism vs. Evolution Forum, Moderator
77. 1/17/00, American Association of Physics Teacher Winter Meeting, Contributed Papers: "Software for Teaching Spectroscopy", Teaching Wave Mechanics with Wavemaker", Invited paper: "Prerequisite Relationships Between Astronomy Concepts."
78. 4/8/00, Putting a Charge in Middle School Science, Batteries, Cells, and Electrochemical Reactions. NSTA, Orlando, FL
79. 4/8/00, Putting a Charge in Middle School Science: Batteries, Cells, and Electrochemical Reactions, . NSTA National Convention, Orlando, FL
80. 10/12/00, Lesley University Pre-Service Workshop on Engineering Projects. Brookline, MA
81. 10/12/00, Lesley University Pre-Service Teacher/Mentor Seminar, Brookline, MA
82. 10/28/00, Remote Experiments in Science Education Conference, Liquid Crystal Institute, Kent State University, Kent, Ohio. Invited paper: "Student Projects Using a Worldwide Network of Remote Telescopes."
83. 1/7/01, Joint American Astronomical Society – American Association of Physics Teachers, Annual Meeting, San Deigo, CA Plenary: Preparing students for success in college physics: Which high school make the grade?
84. 1/7/01, Joint American Astronomical Society – American Association of Physics Teachers, Annual Meeting, San Deigo, CA contributed papers: A Role for Observational Journals in Introductory Astronomy Courses
85. 1/7/01, Joint American Astronomical Society – American Association of Physics Teachers, Annual Meeting, San Deigo, CA Popper and Kuhn Come to Visit: A Nature of Science Roleplay
86. 1/7/01, Joint American Astronomical Society – American Association of Physics Teachers, Annual Meeting, San Deigo, CA Students' Conceptions of Light and Color and How They Change
87. 1/7/01, Joint American Astronomical Society – American Association of Physics Teachers, Annual Meeting, San Deigo, CA ``From the Ground Up: Investigations in Physical Science Using the MicroObservatory Online Telescopes
88. 10/13/02, Astronomical Data Analysis Software & Systems XII, Baltimore, Maryland USA. Invited Paper: The Design of the MicroObservatory Network of Educational Telescopes.
89. 10/15/02, Analysis Software and Systems. Baltimore, MD Invited paper.
90. 7/13/04, *Student's pathways: High school labs and college achievement*. National Research Council, Invited Presentation to High School Laboratories: Role and Visions Panel Meeting, Washington, DC, with Robert Tai.
91. 4/4/05, *Long-range impact of autonomous student learning in labs and projects on college science performance*. National Association for Research in Science Teaching Annual Conference, Dallas, TX, with Robert Tai.
92. 4/11/05, *Interactions of High School Student Autonomy and Mathematics Achievement Predictors on College Science Performance* American Educational Research Association Annual Conference, Montreal, PQ, Canada, with Robert Tai.
93. 1/7/06, *Astronomy Education Research: A Post-Doc Primer*, NSF Astronomy & Astrophysics Postdoctoral Fellows Symposium, Washington, DC.
94. 5/2/06, NASA Space Science Forum Meeting, Cambridge, MA. Invited Talk: *Putting Numbers to Our Theories: Assessment in the Service of Astronomy and Space Science*.
95. 10/24/06, Math Science Partnership of Southwest Pennsylvania, Pittsburgh, PA. Keynote: *Mathematics and Misconceptions: Factors Influencing College Success*.
96. 11/3/06, *When Two Reforms Meet: Good For High School Science?* EDC conference on high school and science reform,
97. 11/30/06, Education Development Center Conference, Cambridge, MA. Keynote: *When Two Reforms Meet: Good For High School Science?*

98. Sadler, P. M., & Tai, R. H. (2006, December). Does Taking Physics Pay Off Later in Chemistry and Biology Courses?. In *Bulletin of the American Astronomical Society* (Vol. 38, p. 976).
99. 1/7/07, AAPT/AAS Joint Meeting, Seattle, WA. Invited Talk: *When Was the Last Time 5000 College Students Gave You Feedback on Your High School Physics Course?*
100. 2/1/07, State Collaborative on Assessment and Student Standards (SCASS), New Orleans, LA. Invited Talk: *Primer on Science Assessment*.
101. 2/17/07, Advanced Placement and the Introductory College Science Course, AAAS Annual Conference, St. Louis, MO.
102. 4/1/07, National Science Teachers Association, St. Louis, MO. *MOSART: Assessing What Teachers and Students Really Know!*
103. 4/15/07, NARST, New Orleans, LA. Invited Talk: *Development and Findings from Diagnostic Tests in the Physical, Earth, and Space Sciences*.
104. 4/21/07, AAPT New England, Orono, ME. Invited Talk: *Physics Students Report*.
105. 5/11/07, Conference on Advanced High School Coursework in Science and Mathematics, Cambridge, MA. Invited Talk: *Policy Impact of Advanced High School Coursework*.
106. 5/17/07, Concord Consortium, Concord, MA. Do the Standards Fit? *How Measures of PCK, SMK, and Student Learning Inform Curriculum and Professional Development*.
107. 5/18/07, National Sciences Resource Center, National Advisory Board Meeting, Washington, DC: *Current Research Relating to High School and Undergraduate Science Learning*
108. 6/21/07, *What Research Says to Beginning Teachers*, Summerbridge Program, Cambridge, MA. *Cambridge, MA*
109. 6/27/07, *Predicting College Performance*, Gordon Conference on Chemistry Education Research and Practice, Bates College, Lewiston, Maine
110. 6/28/07, *Current Research Relating to High School and Middle School Inquiry*, Milton Academy Institute for Inquiry, Milton Academy, Milton, MA,
111. 7/11/07, *Current Research Relating to Science Learning*, Summerbridge Training Institute, Cambridge, MA
112. 8/15/07, *Current Research Relating to High School and Undergraduate Science Learning*, Burroughs-Wellcome Fund – Student Science Enrichment Program, Research Triangle Park, NC
113. 9/24/07, An Idiosyncratic Primer on Educational Research, 2007 Astronomy Education Research Symposium, Tufts University, Medford, MA
114. 10/23/07, *Science Education: Challenges and Current Solutions*, Howard Hughes Medical Institute, Chevy Chase, MD
115. 11/1/07, Philip Sadler, invited speaker at the International Mind, Brain, and Education Society conference, Fort Worth, TX.
116. 1/16/08, *Tools for Making Professional Development “Pay Off” in Science*, National Governors’ Association/NSF Science Educational and Workforce Development, Washington, DC
117. 1/25/08, *What Pays Off: Strategies for Optimal Science Learning*
118. 3/26/08, *MOSART & What We Have Learned about Student Misconceptions in Science*, Council of State Science Supervisors, Boston, MA
119. 3/28/08, *MOSART: Assessing the Effects of Professional Development on Teacher and Student Content Knowledge*, National Science Teachers Association, Boston, MA
120. 3/29/08, *Measurement of Conceptual Understanding in the Physical Sciences*, National Science Teachers Association, Boston, MA
121. 5/29/08, *Separating Facts From Fads: The Evidence that Educators Need for Effective Science Instruction and Policy Decisions*, East Tennessee State University Math and Science Conference, Center of Excellence in Math and Science Education, Johnson City, TN.
122. 6/25/08, Keynote: *Current Research Relating to High School and Undergraduate Science Learning*, Milton Academy Institute for Science Inquiry, Milton, MA
123. 6/30/08, Lessons from Surveying, Pre-College Science Practices, Workshop on Linking Evidence and Promising Practices in STEM Undergraduate Education, National Research Council, Board on Science Education, Washington, DC
124. 8/15/08, *Current Research Relating to High School and Undergraduate Science Learning*, Burroughs-Wellcome Fund – Student Science Enrichment Program, Research Triangle Park, NC
125. 1/8/09, Zahra Hazari, Philip Sadler, Robert Tai. Gender Differences in College Physics Performance and Pre-College Physics Experiences. Talk given at American Association of Physics Teachers (AAPT) Meeting, Baltimore, MD,

126. 2/27/09, *STEM Symposium 2009: "A Private Universe: What Research Says about Learning Science,"* Urban Center for the Advancement of STEM Education, Indiana University-Purdue University, Indianapolis, IN
127. 3/13/09, Keynote: What Predicts Success in Learning Physics? Phys Teacher Education Coalition Conference, The American Physical Society, Pittsburgh, PA
128. 3/19/09, *MOSART: Assessing the Effects of Professional Development on Teacher and Student Content Knowledge*, National Science Teachers Association Annual Conference, New Orleans, LA
129. 3/20/09, *Preparing Students for Success in College Science*, National Science Teachers Association Annual Conference, New Orleans, LA
130. 5/1/09, Keynote: *Separating Facts From Fads: The Evidence That Educators Need for Effective Science Instruction and Policy Decisions*, 2009 Chicago Symposium Series on Excellence in Teaching Mathematics and Science: Research and Practice, Northeastern Illinois University, Chicago, IL
131. 5/8/09, Keynote: *What Predicts Success in Learning Physics?* Annual New England Section joint AAPT/APS Spring meeting, Northeastern University, Boston, MA.
132. 6/2/09, Education Research in the Service of Museums, Smithsonian Affiliations National Conference, Washington, DC.
133. 8/7/09, Zahra Hazari, Philip Sadler, Gerhard Sonnert. Female Persistence Factors: Female physicists' views on high school influences. Talk given at American Association of Physics Teachers (AAPT) Meeting, Greensboro, NC.
134. 3/19/10, MOSART Life Science, National Science Teachers Association, Philadelphia, PA
135. 3/20/10, MOSART Professional Development, National Science Teachers Association, Philadelphia, PA
136. 1/10/11, Celestial Navigation for the Novice, American Astronomical Society Meeting, Seattle, WA
137. 01/12/11 The Astronomy and Space Science Concept Inventory: Assessment Instruments Aligned with the K-12 National Science Standards, American Astronomical Society Meeting, Seattle, WA
138. 1/24/11, *MOSART: From MSP to teacher to student*, Invited Talk, Invited Talk, NSF Math Science Partnership Annual Conference, Washington, DC
139. 3/11/11, Celestial Navigation for the Novice, National Science Teachers Association, San Francisco, CA
140. 5/25/11, Lessons from Outreach: What works; what doesn't. American Astronomical Society Meeting, Boston, MA
141. 6/21/11, *Building Assessment Literacy: Multiple Forms of Data*, Data Wise: Using Assessment Results to Improve Teaching and Learning, Harvard Graduate School of Education, Cambridge, MA
142. 11/3/11, Keynote: *Pre-College Predictors of College Persistence and Performance in STEM Fields*, College and Career Readiness Initiative, Texas Higher Education Coordinating Board, Dallas, TX.
143. 1/6/12, *Issues of the Transition to College Mathematics, Factors Influencing College Success in Mathematics*, Invited Paper, Mathematics Association of America Annual Meeting.
144. 3/30/12, *Assessing Gains Made During Middle School Life Science Professional Development*, National Science Teachers Association, Indianapolis, IN.
145. 3/31/12, with Jamie Miller, *MOSART-LS: Misconception Oriented Standards-based Assessment Resource for Teachers in Life Science*, National Science Teachers Association, Indianapolis, IN.
146. 4/24/12, 2012 Research Presession: Factors Influencing STEM Preparedness: From Algebra to Calculus, National Council of Teachers of Mathematics Annual Meeting,
147. 6/8/12, *Factors Influencing College Success in Mathematics*, Battles Lecture (Keynote), Northeast Section of the Mathematics Association of America
148. 8/1/12, *Separating Facts From Fads: How Our Choices Impact Students' Performance and Persistence in Physics*, Millikan Medal Talk, American Association of Physics Teachers Annual Meeting, Baltimore, MD.
149. 10/10/12 *Separating Facts From Fads: How Our Choices Impact Students' Performance and Persistence in Science, Technology, Engineering, and Mathematics*, Invited Talk, University of Virginia.
150. 1/17/13 *Separating Facts From Fads: How Our Choices Impact Students' Performance and Persistence in the Life Sciences*, Invited Talk, National Institutes of Health, Washington, DC.
151. 3/22/13, *Separating Facts From Fads: How K-12 Educators' Choices Impact Students' College Performance and Persistence in STEM*, NSF Successful K-12 STEM Education Baltimore, MD
152. 4/13/13, *The Science Behind Advanced Coursework in High School*, National Science Teachers Association,, San Antonio, TX
153. 5/7/13, *Developing Effective Multiple-Choice Questions: A Primer In Psychometrics*, Harvard Faculty Assessment Retreat, Cambridge, MA
154. 5/20/13, *Separating Facts From Fads in STEM Education*, Senate STEM Education and Workforce Caucus, Washington, DC

155. 10/15/13, Keynote, *Separating Facts From Fads*, Bridging the Gap Conference, North Carolina Association for Biomedical Research, Chapel Hill, NC
156. 11/13/13 *Developing Effective Multiple-Choice Questions for MOOCs: A Primer In Psychometrics*, HarvardX, Cambridge, MA
157. 3/5/14, *Outreach Programs and Science Career Intentions (OPSCI)*. NSF PI Meeting Poster, Washington, DC
158. 3/27/14, *Middle School Outreach at the CfA*, American Institute of Physics. College Park, MD
159. 4/4/14, *The Science Behind Advanced Placement*, National Science Teachers Association Annual Conference, Boston, MA
160. 4/7/14, *Employing Distracter-Driven Assessments in Measuring Teacher Knowledge and Effectiveness*, Invited Talk, American Educational Research Association Annual Conference, Philadelphia, PA.
161. 8/5/14, *MOSART HSLS*. NSF PI Meeting Poster, Washington, DC
162. 10/8/14, *How do decisions made by high school students and teachers play out in college calculus?* Invited Talk, Kaput Center Interdisciplinary Colloquium Series, UMass, Dartmouth, MA
163. 10/10/14, *How Our Choices Impact Students' Performance and Persistence in STEM*, Keynote, Terra Education Conference, Syracuse, NY
164. 5/10/14, *Separating Facts From Fads in STEM Education* Keynote, Terra Science and Education Conference on STEM in Urban Education, Syracuse, NY.
165. 10/8/14, *Factors Influencing College Success in Mathematics*, Invited Talk, Kaput Center, UMass Dartmouth.
166. 1/6/15, *Employing Distractor-Driven Assessments in Measuring Teacher SMK and PCK*, Invited Talk, American Association of Physics Teachers Winter Meeting,
167. 2/15/15, 3/12/15, *Design Challenges for Middle School*, Contributed Talk, NSTA Annual Conference, Chicago Il.
168. 3/13/15, *Crowdsourcing to Develop Test Items for the HS Life Science NGSS*, Contributed Talk, NSTA Annual Conference, Chicago Il.
169. 3/15/15, *The Science Behind Advanced Coursework in High School*, Contributed Talk, NSTA Annual Conference, Chicago Il.
170. 2/12/15, *Attitudes, Skills, and Motivations of Our Students in Introductory College Math and Science Courses*, Invited talk, Florida International University, Miami, FL.
171. 11/16/15, *The Influence of Teacher Knowledge on Student Learning*, Invited Talk, HUGSE Learning & Development Colloquium
172. 3/16/16, *The Role of High School Preparation in the Transition to College Calculus*. Invited Talk, Workshop on The Role of Calculus in the Transition from High School to College Mathematics MAA, Washington, DC
173. 3/31/16, *The Science Behind Advanced Coursework*, National Science Teacher Association Annual Conference. Contributed Talk.
174. 4/1/16, *Daytime Astronomy*, National Science Teacher Association Annual Conference. Contributed Talk.
175. 4/3/16, *How STEM Career Interest Changes in High School*, National Science Teacher Association Annual Conference. Contributed Talk.
176. 10/28/17, *Best Practices in STEM Education: Separating Facts from Fads*, Invited Talk, 14<sup>th</sup> Annual Best Practices Conference on Teaching and Learning, Puerto Rico Louis Stokes Alliance for Minority Participation, University of Puerto Rico - Cayey Campus, PR
177. 1/6/17, *Insights from MAA studies of College Algebra, Precalculus, and Calculus*, Invited talk. Joint American Mathematics Society/Mathematical Association of America Meeting, Atlanta, GA